FSA Modernization Partner

United States Department of Education

Federal Student Aid

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1 Introduction

1.1 Executive Summary

The *Technical Architecture Services Report: Fourth Quarter for FY 2002* summarizes the Integrated Technical Architecture (ITA) team's tasks related to implementing Task Order 69 during the fourth quarter of FY 2002. The ITA provides a standardized, reusable infrastructure for enabling business capabilities within the FSA application community. The long-term vision of the ITA is to provide an integrated, enterprise-wide technical architecture that will enable FSA to reduce the number of custom-built applications that are difficult and costly to update and maintain.

The ITA team's tasks fall into the following categories:

- Core ITA Support – Provides a standard development architecture / procedures for FSA application teams
- Technical Architecture Support – Provides infrastructure and application architecture expertise to FSA application teams
- Provide Roll Out Support – Build out of environments (development, test, staging, and production) and system upgrades for FSA application teams
- Product Specialist Support – Provides support for specific software products used in FSA
- Reusable Common Services (RCS) - Provides a set of reusable basic application services based on open-source technology and Java 2 Enterprise Edition (J2EE)
- Performance Testing – Provides integrated performance management for applications to enable teams to load and stress test their web-based applications. The goal is to improve application performance, availability, reliability and scalability

The rest of the report provides a description of the ITA team's tasks performed within these categories during the fourth quarter of FY 2002.

1.2 Support Areas

During the fourth quarter of FY 2002, the ITA team provided technical support to FSA in the following areas:

- Core ITA Support
- Technical Architecture Support
- Providing support during roll out
- Product Specialist Support
- Performance Testing.

The following sections describe the specific tasks the ITA team performed in these support areas.

2 Core ITA Support

2.1 Deliverables

The ITA team produced the following deliverables:

- 69.1.5 - The ITA Release 3.0 Build and Test Report
- 69.1.6c - The Technical Architecture Quarterly Services Report – 3QFY02
- 69.2.1f - The Technical Architecture Application Maintenance Services Report (July)
- 69.2.1g - The Technical Architecture Application Maintenance Services Report (August)
- 69.2.1h - The Technical Architecture Application Maintenance Services Report (September).

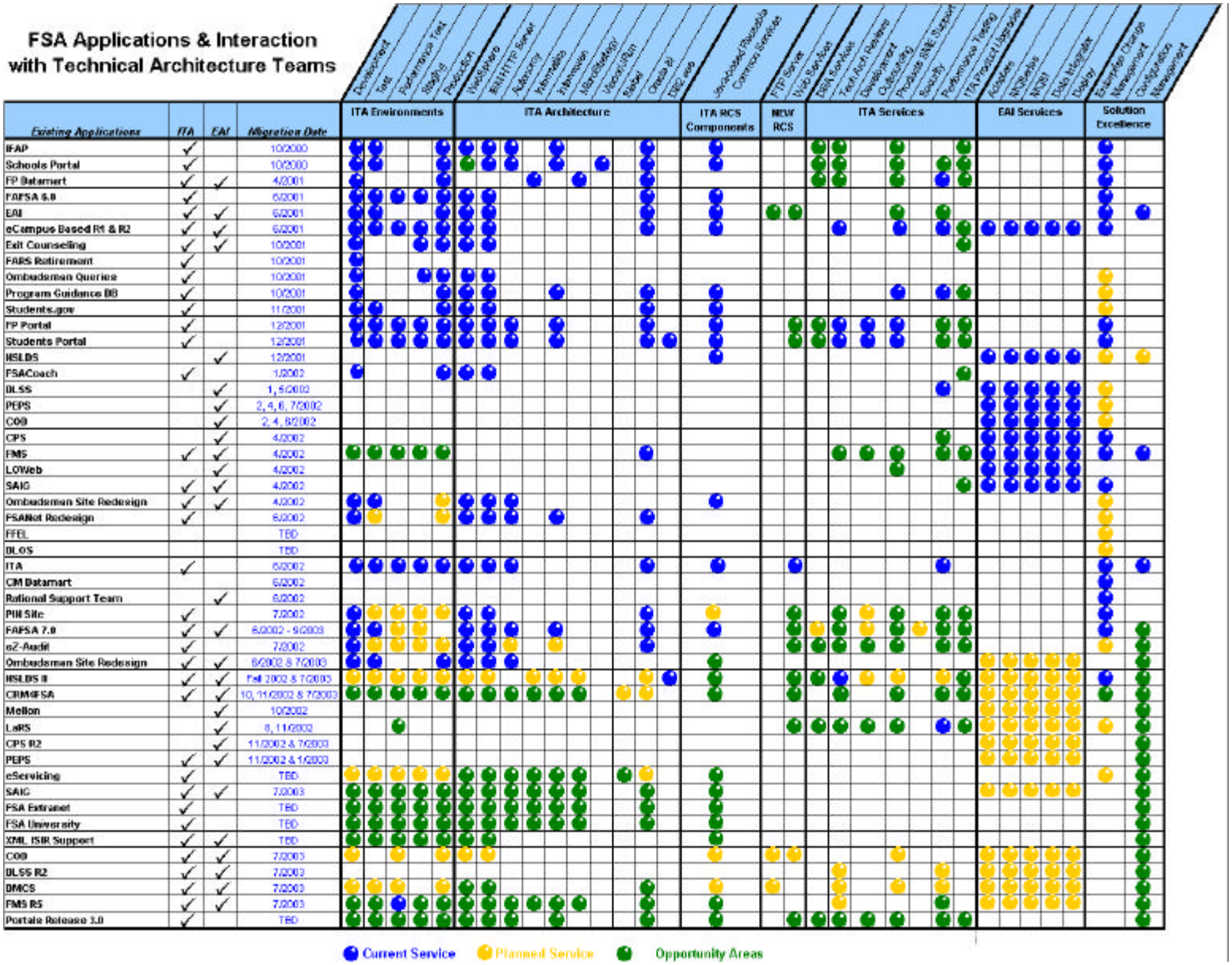
2.2 ITA Application Maintenance Services

The ITA's activities in the application maintenance arena during this quarter helped applications extensively and in several aspects. The ITA team troubleshoots problems and fixes bugs for applications such as Schools Portal, Students, Portal Financial Partners Portal, FAFSA and Data Marts and ensures their availability. Refer to the Technical Architecture Application Maintenance Report for July, August, and September for in-depth discussion of ITA's activities for operations related tasks.

2.3 Current FSA Applications and the ITA Environment

The table below shows the FSA applications running in the ITA environment with RCS components.

FSA Applications & Interaction with Technical Architecture Teams



2.4 Software Upgrade Planning

In order to remain current with new releases of products, bring new product capabilities to the architecture, and to stay ahead of end-of-service timelines many ITA products will be upgraded over the coming year. The upgrade plan is carefully created to take into account product dependencies, application testing, application go-lives, and server availability.

The first scheduled upgrade is to the operating system (OS) from Solaris 6 to Solaris 8. This OS upgrade will bring increased performance and stay current with Sun OS upgrades. The Solaris 8 upgrade is scheduled to wrap up by calendar year's end (refer to the timeline below).

The second major upgrade is to the Application Server from WebSphere 3.5 to WebSphere 4.0. The new WebSphere 4.0 is fully J2EE certified, brings performance enhancements, easier administration, built-in web services support, and better deployment tools. The WebSphere 4.0 upgrade is dependent on the Solaris 8 upgrade and is scheduled to be completed by June 2003 (refer to the timeline below).

The next upgrade is to the Load Balancer from Network Dispatcher 3.6 to Network Dispatcher 4.0. This Network Dispatcher upgrade provides extended monitoring and customizing options, load balancing based on server CPU load, and enhanced security. The Network Dispatcher upgrade is also dependent on the Solaris 8 upgrade and is scheduled to be completed by February 2003.

The fourth product upgrade is to the Data Reporting tool from MicroStrategy 7 to MicroStrategy 7i. The new MicroStrategy 7i provides a web-based interface for development, 508-compliance, and numerous fixes to the current release. The MicroStrategy 7i upgrade is scheduled to be completed by February 2003.

The fifth major upgrade is to the Content Management tool from Interwoven 5 to Interwoven 5.5. This new Interwoven 5.5 release brings bug fixes, advanced maintenance capabilities, enhanced administration tools, and advanced workflow capabilities.

The final scheduled upgrade is the Search Engine tool from Autonomy 2.2 to Autonomy 4.0. The new Autonomy 4.0 enhances the customization capabilities, upgraded Internet indexing, and more options for indexing documents.

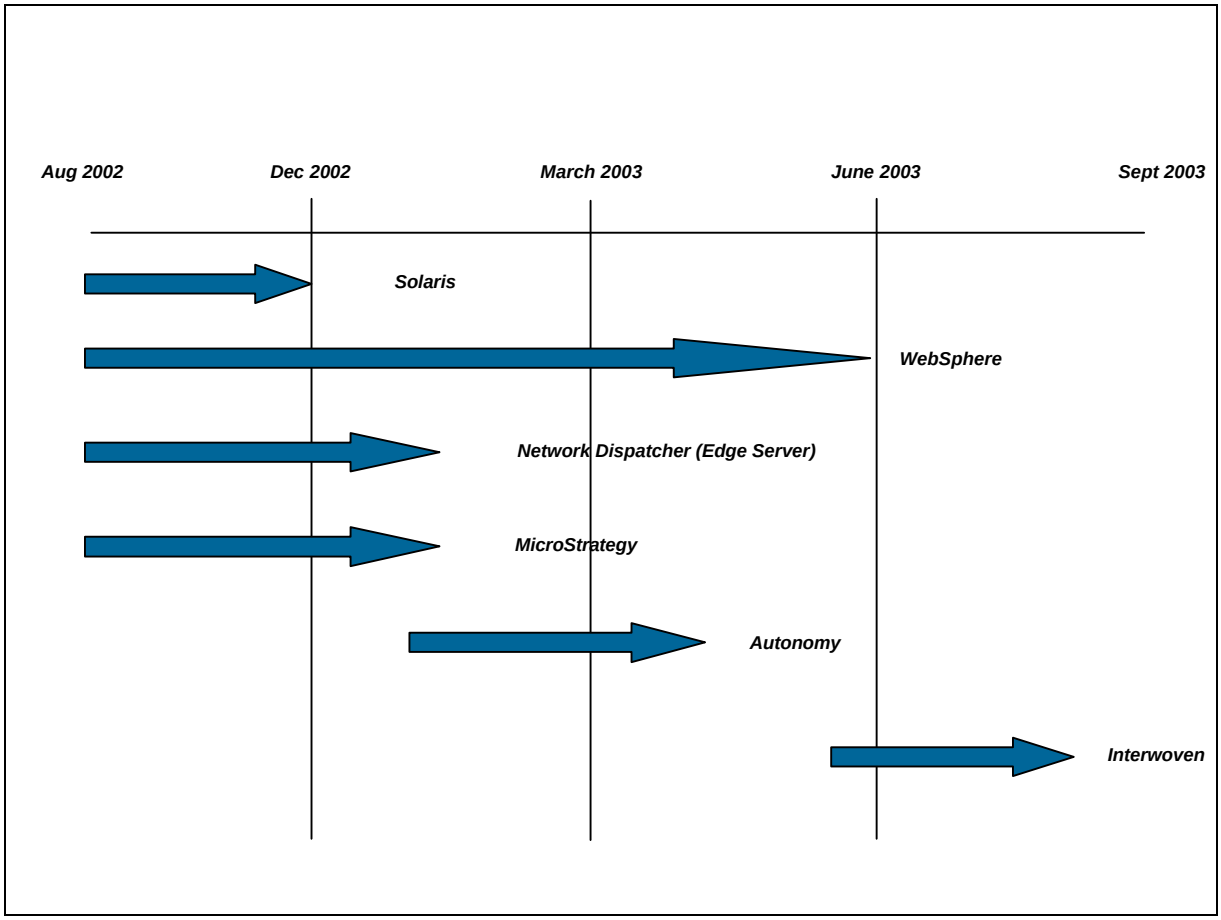


Figure 1: ITA Environment Upgrade Plan

3 Technical Architecture Support

3.1 Technical Support

The ITA team provided technical support and change requests for the FAFSA, eZ-Audit, NSLDS II, and Students and Financial Partners Portals application teams. Examples of this type of support include restarting servers, updating configurations, adding new configurations, and debugging problematic application code.

3.2 Architecture Operation Support

The ITA team provided the following production support for the IFAP, Schools Portal, Students.gov, eCB, Program Guidance, Students and Financial Partners Portals, and CFO & Financial Partners Data Mart:

- Troubleshooting of WebSphere, Viador, IHS, Autonomy, and Network Dispatcher issues
- Monitoring of core application processes within the production ITA
- Providing assistance with updating Autonomy to fit the application teams' needs as well as providing estimates for enhancement requests from the teams.

3.3 Additional Application Support

The ITA supported a number of teams in the fourth quarter of fiscal year 2002. The ITA team assisted the following teams to meet their goals, objectives, and task order requirements:

- Maintained Students & Financial Partners Portals performance test and production environments
- Assisted IFAP and Schools Portal applications with Interwoven and Autonomy development and search issues
- Assisted eZ-Audit application with initiating build of development environment
- Assisted eZ-Audit application with ClearCase development bid.

3.4 eZ-Audit Support

ITA reviewed the eZ-Audit Detailed Technical Design deliverable and found some issues and gaps that need to be addressed. ITA conducted a review with eZ-Audit and provided comments and feedback on the issues and gaps.

Areas for concern included:

- Lack of object model, class diagrams, sequence diagrams, and object-data mapping model
- Application level exceptions and logging levels were not defined
- Source file locations for configuration framework were not listed

- Details for the interface with PEPS were missing
- Batch schedule was not provided

Actions from the review session for ITA were to provide the review in an SQA format and also provide an example of an object-data mapping model. ITA also provided a walkthrough of the Web Conversation framework to eZ-Audit. eZ-Audit actions included: provide the object model and class diagrams; provide additional information for using the Exception Handling, Logging, and Configuration frameworks; and add additional information regarding the interface to PEPS, such as if filters need to be created, the design of the program, and how PEPS will interact with the database. eZ-Audit made updates to the documents from the feedback provided by ITA.

3.5 NSLDS II Support

ITA assisted with the planning of NSLDS II application environment architecture and created the application architecture detailed design document. The design included content on how the NSLDS II application will be hosted on the shared ITA environment, the RCS components that will be leveraged for the application, suggested Interwoven usage, and the security design for the application. The document included the object model and the next release will include class diagrams, sequence diagrams, and an object-data mapping model.

3.6 Roll Out Support – ITA Environments

The ITA team built and configured the following environments on WebSphere Application Server, IBM HTTP Server, and Oracle database:

- FAFSA development, test, and performance test environments for WAS 3.5.6
- PIN Site development and test environments for WAS 3.5.6
- PIN Site Web Services configuration for development and test environments
- Migrated the FAFSA Demo Production environment into the Sun Production environment
- eZ-Audit development environment
- Performance Test environment for the Students and Financial Partners Portal R2.

In addition, the ITA team:

- Provided assistance with performance issues for Program Guidance and Students.gov session problems
- Developed FAFSA Performance Test plan and began performance testing for FAFSA 7.0
- Investigated FAFSA production problems
- Completed upgrade of WebSphere to 3.5.6 for the FAFSA environment
- Continued upgrade strategy for Informatica, Solaris, Interwoven, and MicroStrategy

- Implemented Java Cryptography Extensions (JCE) API for the Students and Financial Partners Portal
- Upgraded Network Dispatcher to version 3.6.1.11
- Installed WebSphere 4.0 to begin building knowledge and familiarity with the new version.

4 Product Specialist Support

4.1 FSA Application Team Support

The ITA team performed performance testing for FAFSA, PIN, FMS/LARS and, Financial Partners and Students Portals. ITA also assisted with capacity planning for FAFSA, PIN, and Financial Partners and Students Portals.

4.2 Interwoven Support

The ITA provided Interwoven support to many teams, specifically:

- Worked with the NSLDS II team to identify application areas best managed by Interwoven. In the coming months, NSLDS II will be added to the existing Interwoven environment to manage FAQ documents and deploy them to the NDSDS II environments
- Provided troubleshooting support for the existing applications utilizing Interwoven, which includes IFAP, Schools Portal, FSANet, FAFSA, Students and Financial Partners Portals, and Program Guidance
- The ITA also assisted application maintenance teams with Interwoven enhancement requests
- ITA assisted with development of the Content Management strategies for the Students and Financial Partners Portals, including templates and custom-built workflows, which incorporate email notification and automatic deployment of content to the test and production environments
- Resolved problems that occurred during the deployment of content to servers and databases; such as, resolving permission issues within development workareas and managing user access to the tool as developers join and depart from application teams.

4.3 Autonomy Support

ITA is currently exploring possible solutions to improve on the current FSA enterprise search capability. In spite of incremental improvements to the search capability in Autonomy by enhancing the quality of the search results and result summaries, the user community is continuing to seek improvements on the search results and the user experience.

Two avenues are being pursued to resolve this problem:

- ITA is currently in discussion with Autonomy to determine if the solution to the search problem can be resolved once and for all with the use of Autonomy as the search engine
- After an analysis of the current search engine products, Google Search Appliance, has been determined to be the best candidate to improve the current search capabilities. ITA has acquired the Google Search Appliance on a 30-day free trail basis to examine the appliance's features and capabilities, and to prototype an existing application with the Google's search capability.

5 Performance / Load Testing Support

The ITA has established an application performance testing lab with software, specialist expertise, and infrastructure to enhance the performance of FSA's web-based applications. Performance testing enables application teams to quickly identify and correct performance related problems prior to an application's migration to production. Load testing and stress testing services are now available to application teams whose aim is to increase the performance of their application, reduce time to market, and reduce costs.

5.1 Students & Financial Partners Portals:

The FSA Students and Financial Partners Portals bring together, in one simple site all the information and productivity tools relevant to FSA's customers, employees, and partners. The Portals empower financial partners to make informed financial aid decisions to assist students. The Portals are linked with existing FSA web sites (e.g. FAFSA, NSLDS, and DLSS) using the ITA infrastructure. The Portals will bond all of FSA's web services together providing a uniform starting point for students and financial partners to access FSA.

The FSA development team of the Portals application had the following goals in mind:

- Detect and resolve issues with the Portals application
- To achieve support of 1400 concurrent users for both Portals
- To discover the application's stress point.

The ITA performance test spanned five cycles, and each cycle had a number of trials, which were designed to achieve those specific objectives. Several combinations of business processes, infrastructure configuration, and concurrent user levels were assembled to determine the Portals application's characteristics under load. Performance testing takes an evolutionary approach to problem solving, in that each trial yields results that lead to specific solutions. Each cycle is then examined as a whole and improvements are incorporated into the next cycle. The benefit of this approach is a continual enhancement of application performance.

Overall the Students and Financial Partners Portals performance test effort met its objective. The chronology of the test followed the progressively higher goals of the application's capacity to support concurrent users. The first performance test cycle established a baseline for further testing. The second performance test cycle met the stated goal of supporting 1400 users.
After the completion of Cycle 2, the ITA was informed of legal implications that would impact the application and its functionality. Consequently, the database for the application was moved from the VDC to XAP – an application functionality provider. Therefore, Cycle 3 performance test established a new baseline. As for Cycle 4 performance test, the goal of supporting 1400 concurrent users was met successfully.

The Portals application team carried out further changes to the Students Portal portion of the application by removing the following functionality:

- Scholarship search
- Student planner
- Career survey.

These modifications to the Portals application necessitated re-establishing a new performance test baseline at the commencement of Cycle 5. This performance test cycle was comprised of 10 trials, in which the application's performance target of supporting 1400 concurrent users was achieved. Moreover, Cycle 5 performance test identified the Portals application's stress point, which stood at 1500 concurrent users in the performance test environment.

5.2 Lender Reporting System (LaRS)

Lender Reporting System (LaRS) is being developed as part of the Financial Partners (FP) redesign efforts. The goal of the LaRS program is to develop a system that will streamline the business processes associated with exchanging financial information with Lenders and Servicers. This involves developing new business activities that integrate Lender and Servicer reporting with FMS. These business activities include: allowing Lenders and Servicers to electronically complete and submit their reports, developing digital approval and ad hoc query functionality, complying with current legislative mandates, providing timely notification of errors following submission, and integrating all activities with concurrent FSA enterprise-wide initiatives. A performance testing effort was planned and conducted on the LaRS application.

Overall, four tests were executed from August 28, 2002 through September 5, 2002. Each performance test cycle focused on a specific area of the LaRS Application and its interaction with the FMS application. All the LaRS business processes were executed in each test cycle along with background noise from the FMS and the ARAP applications. These tests were run to identify issues with the hardware, Web server, Oracle database server, and the application / form servers.

The HP-UX Operating System kernel parameters were updated, and Oracle databases connection configuration changes were implemented, as an outcome of the performance tests. The LaRS performance test met is stated objective of supporting 476 concurrent users.

5.3 FAFSA 7.0

The Office of Federal Student Aid Programs (FSA) administers and operates the "Free Application for Federal Student Aid" (FAFSA). While available in paper form, FSA also provides this service through a web site. U.S. college students seeking student financial aid use the FAFSA program. During the academic year 2001-2002, over six million students used the web site to apply for federal financial aid. FSA anticipates that the number of users / applicants will increase by 50% during the 2002-2003 academic year, and will continue to rise in future years as the number of paper submissions decreases. This anticipated growth makes it imperative that FSA maximize the capacity and availability of the FAFSA web infrastructure while at the same time minimizing the amount of support FSA's representatives will have to provide for questions by students or difficulties with completing the form. The web FAFSA product is commonly referred to as FAFSA on the Web and incorporates all requirements related to the paper FAFSA for each school year.

5.3.1 Objective

The purpose of ITA's performance test is to:

- Validate the n-tier architecture for FAFSA 7.0
- Verify that the application will scale
- Verify the performance capability of FAFSA 7.0 relative to users
- Validate the N-Tiered architecture for PIN by testing two business processes (three tests – FAFSA authentication, other application authentication, and PIN registration).

5.3.2 Business Processes

The following list outlines the FAFSA business processes, as well as business processes that impact FAFSA, that are slated for testing:

- Fill out a FAFSA and Submit– Form to fill out and submit a FAFSA
- FAFSA Renewal – Renew an application
- FAFSA Corrections – Correct an existing application
- Student Access - Accessing the existing application
- Request Application Status – Check application status
- Electronic Signature – Electronic Signature for an application
- School Code Search – Search the codes for a particular school
- FAA Online Access – FAA entry (Renewal and Correction only)
- Pin Authentication.
- Pin Registration – Register the user to get a new PIN.Schedule

5.3.3 Schedule

The FAFSA performance will begin in September 2002 and continue throughout December 2002. The FAFSA test plan calls for 23 performance test cycles. While the goals for each test cycle differ, they generally support the overall objective of enhancing the performance of the FAFSA application.

6 ITA Reusable Common Services (RCS)

The design and build phases for RCS development is complete and the Build and Test Report for the RCS components is now in progress. The Build and Test Report documents the build procedures, test conditions, and results of the ITA Release 3.0 Reusable Common Services.

ITA Release 3.0 RCS includes:

- Web Conversation Framework
- File Transfer Protocol Framework
- XML Helper Framework
- Scheduler Framework
- User Session Framework
- Web Services (SOAP) Framework
- Configuration Framework
- JSP Tag Library